



INTRODUCTION

Mercy Regional EMS LMA Pilot Project

Mercy Regional EMS of Paducah, Kentucky presents for approval by the Kentucky Board of Emergency Medical Services this pilot project for the use of laryngeal mask airways by certified paramedics. This project is the key part of an overall review and update of our ALS protocols.

Airway management has proven to be one of the key life saving skills of the paramedic. Endotracheal intubation is the "gold standard" of airway management. However, this skill can be difficult to learn and to maintain. Failed intubation and the deterioration to the "cannot intubate and cannot ventilate" situation can result in brain damaging hypoxia and death. The most recent recommendations of the American Heart Association do not give a clear consensus of which alternative airway device is most appropriate when endotracheal intubation has failed. Pilot programs have been in place utilizing the combutube but none have been conducted with the LMA in the Commonwealth of Kentucky.

The laryngeal mask airway (LMA) was developed in 1980 and has become a routine airway device in operating rooms. Approximately 1500 articles have been published on the LMA. In recent years the LMA has been utilized in Emergency Medicine and Pre-hospital Care as both a primary airway device and as a "rescue" device in situations of failed intubations. Several states have approved the LMA for pre-hospital use. The simplicity of the LMA's design, ease of placement, high success rates and low complication rates, account for the increased popularity.

Keys to implementation of this pilot project will be a didactic program, skills practice, clinical airway rotation in the operating room with Anesthesia providers skilled in LMA use, close Q & I monitoring utilizing an Airway Management Form, and strong Medical Direction.

Respectfully Yours,

Irvin E. Smith, MD
Assistant Medical Director
Mercy Regional EMS

LMA

In-service Training Program

This *LMA*TM Pre-Hospital Pilot Project is the training protocol used by Mercy Regional EMS system. The training protocol used by any agency with reference to the pre-hospital use of *LMA*TM airways, is exclusively dependent upon medical control of that agency.



MREMS Pre-Hospital LMA Pilot Project has been adapted with permission from "LMA In-Service Training Program" for Orange County Florida EMS by Jennifer Jensen and Dr. Sal Silvestri, EMS Medical Director. MREMS would like to recognize their Contribution to EMS by allowing other agencies to utilize their program.

Executive Director

James C Locke:

Medical Director

John L Myers:

[Signature of James C Locke]
[Signature of John L Myers]

Date: 1 / 18 / 03

Date: 1 / 17 / 03



In-service Training Program Schedule

Pre-Program Study Materials:

- LMA-Unique Instruction Manual
- The Laryngeal Mask Airway: A Comprehensive Review For The Emergency Physician. Pollack, C.V., The Journal of Emergency Medicine, Vol.20, No.1, pp53-66, 2001.

Introduction 5 min.

Review of Video Tapes

1. LMA Anatomy/Physiology Video (support material) 10 min.
2. LMA Insertion Video (support material) 10 min.

**Review of a PowerPoint Slide Presentation and
Review of Protocol** 30-45 min.

A PowerPoint presentation has been developed that closely parallels the procedural protocol that will be published in the procedure manual. Both of these are enclosed. Handouts may be created from the enclosed files. Included in this discussion should be a detailed review of the airway management protocol, as appears in the protocol manual.

- Skills Station and Case-Based Practical Evaluation
 - This station should be conducted in a case-based format, initially to the entire group 15-20 min.

Laryngeal Mask Airway

Emergency Insertion Procedure

Indications

- ◆ Inability to bag-mask ventilate
- ◆ Inability to endotracheally intubate in patient requiring airway

Contraindications

- ◆ Pharyngeal pathology (abscess or hematoma)
- ◆ Obstructive lesions below the glottis
- ◆ Limited mouth opening
- ◆ Intact gag reflex

Equipment

- ◆ Correctly sized laryngeal mask airway (see chart below)
- ◆ Bag valve mask
- ◆ Oxygen reservoir
- ◆ Suction device
- ◆ Bite block and/or endotracheal tube holder (if available)
- ◆ 25 and/or 35 ml syringes for expanding cuff
- ◆ End tidal CO₂ and oxygen saturation monitoring devices

Laryngeal Mask Airway Sizes					
Mask size	Patient weight (kg)	Age (years)	Length (cm)	Cuff volume (ml)	Largest ETT*
1	< 5 kg	< 0.5 yrs	10 cm	4 ml	3.5 mm
1.5	5-10		10	5-7	
2	6.5-20	0.5-5	11.5	7-10	4.5
2.5	20-30	5-10	12.5	14	5.0
3**	30-60	10-15	19	15-20	6.0
4**	60-80	> 15	19	25-30	6.5
5**	> 80	> 15	19	30-40	7.0

* Appropriately sized endotracheal tube (internal diameter) that can be passed through LMA for blind intubation if intubating LMA is inserted.

** As of this Pilot Project Units are only to carry these sizes

Laryngeal Mask Airway (LMA)

Candidate: _____ Evaluator: _____

Date: _____ Signature: _____

NOTE: If candidate elects to initially ventilate with BVM attached to reservoir and oxygen, full credit must be awarded for steps denoted by ** so long as first ventilation is delivered within 30 seconds.

	Possible Points	Points Awarded
Takes or verbalizes body substance isolation precautions	1	
Opens the airway manually	1	
Elevates tongue, inserts simple adjunct (oropharyngeal or nasopharyngeal airway)	1	
NOTE: Evaluator now informs candidate no gag reflex is present and patient accepts adjunct		
** Ventilates patient immediately with bag-valve-mask device unattached to oxygen	1	
** Hyperventilates patient with room air	1	
NOTE: Evaluator now informs candidate that ventilation is being performed without difficulty and that Pulse oximetry indicates the patient's blood oxygen saturation is 85%		
Attaches oxygen reservoir to bag-valve-mask device and connects to high flow oxygen regulator (12-15 L/Minute)	1	
Ventilates patient at a rate of 10-20/minute with appropriate volumes	1	
Attempts to perform Endotracheal Intubation (may verbalize)	1	
NOTE: Evaluator now informs candidate that ET procedure was unsuccessful.		
Directs assistant to pre-oxygenate patient	1	
Identifies/selects proper equipment for LMA insertion	1	
Checks equipment (deflates cuff completely into a smooth, cup shape)	2	
NOTE: Evaluator to remove OPA and move out of the way when candidate is prepared to insert LMA		
Positions head in neutral position (if C-spine suspected, maintains cervical alignment)	1	
Pulls mandible down to open mouth	1	
Inserts LMA into oral cavity with cuff facing away from hard palate	1	
Advances LMA into oropharynx along the hard palate until resistance is felt	1	
Inflates cuff to proper pressure without holding tube and removes syringe	1	
Confirms proper placement by ensuring black line is midline of upper lip and auscultates bilaterally over each lung and over epigastrium	1	
Further confirms placement with End-Tidal CO2 device and O2 saturation device	1	
Verbalizes findings and interpretations (explains proper color metric, waveform and/or volumetric number for proper placement)	1	
Secures LMA tube (may be verbalized)	1	
Attaches/directs attachment of BVM to LMA tube and ventilates with 100% O2	1	
	22	
TOTAL		

CRITICAL CRITERIA

- _____ Failure to initiate ventilations within 30 seconds after taking body substance isolation or interrupts ventilations for greater than 30 seconds at any time
- _____ Failure to voice and ultimately provide high oxygen concentrations (at least 85%)
- _____ Failure to ventilate patient at a rate of at least 10/minute
- _____ Failure to provide adequate volumes per breath (max. 2 errors/min permissible)
- _____ Failure to pre-oxygenate patient prior to intubation
- _____ Failure to successfully insert LMA within 2 attempts
- _____ Failure to confirm proper placement by observing chest rise, auscultation over the epigastrium, and bilaterally over each lung
- _____ Failure to further confirm placement by End-Tidal device
- _____ Inserts any adjunct in a manner dangerous to the patient.

MERCY REGIONAL EMS
Laryngeal Mask Airway
(LMA)
Written Evaluation Questions

Prepared December 2002



Candidate: _____

Date: _____

Laryngeal Mask Airway (LMA)

Competency for LMA Emergency Insertion Procedure

1. Indications for the placement of an LMA, in proper sequence according to the Mercy Regional EMS System airway algorithm, include which of the following:
 - A. Inability to bag mask ventilate
 - B. Inability to place a combitube
 - C. Inability to endotracheally intubate a patient requiring an airway
 - D. Inability to perform a surgical cricothyrotomy
 - a) A and C
 - b) B and D
 - c) A, B, and C
 - d) All of the above
 - e) None of the above
2. Contraindications to use of an LMA include all but which of the following:
 - a) Pharyngeal pathology
 - b) Apnea
 - c) Infraglottic obstructions
 - d) Limited ability to open the mouth
3. You respond to a witnessed cardiopulmonary arrest. There was no fall and no trauma involved. Which of the following depicts the correct sequence of events for management of this patient's airway?
 - a) Attempt ventilations via BVM, attempt endotracheal intubation x 2, attempt LMA insertion.
 - b) Attempt ventilations via BVM, attempt endotracheal intubation x 1, attempt LMA insertion.
 - c) Attempt ventilations via BVM, attempt endotracheal intubation x 2, attempt needle cricothyrotomy, attempt LMA insertion
 - d) Attempt ventilations via BVM, attempt endotracheal intubation x 1, attempt needle cricothyrotomy, attempt LMA insertion
4. You respond to a motor vehicle crash. You find a 30 year-old male, who was ejected from the vehicle, who is unconscious, unresponsive and apneic. Which of the following are the appropriate interventions?
 - a) One intubation attempt, one person LMA insertion technique
 - b) Two intubation attempts, one person LMA insertion technique
 - c) One intubation attempt, one person LMA insertion technique
 - d) One intubation attempt, two person LMA insertion technique
 - e) Two intubation attempts, two person LMA insertion technique

5. Which of the following sizes of LMA's will be utilized in the Mercy Regional EMS System?
 - a) Sizes 1, 2, and 3
 - b) Sizes 2, 3, and 4
 - c) Sizes 2, 2.5, and 3
 - d) Sizes 3, 4, and 5
 - e) Sizes 4, 5, and 6
6. True or False
Subsequent to the insertion of an LMA, all airway and ventilation assessment procedures must involve evaluation of end-tidal CO₂.
 - a) True
 - b) False
7. True or False
The LMA emergency insertion technique involves placing the fingers into the victim's mouth to ensure proper location.
 - a) True
 - b) False
8. Which of the following is a true statement about placement of an LMA?
 - a) LMA's are appropriate for patients with or without a gag reflex
 - b) LMA's provide secure airways (prevention of aspiration)
 - c) A #4 size LMA is appropriate for an average size adult female
 - d) Over inflation of the cuff is acceptable
9. All but which of the following are true statements about LMA insertion?
 - a) The cuff should be fully deflated prior to insertion into the victim's mouth
 - b) Maintain manual control of tube as the cuff is being inflated
 - c) Secure the tube as you would an endotracheal tube
 - d) The LMA's should be guided into the hypopharynx until resistance is felt
10. Which of the following choices are the appropriate sizes for a 30-50 kg child, an average sized adult male, and an average sized adult female respectfully?
 - a) Sizes 1, 2, 3
 - b) Sizes 2, 3, 4
 - c) Sizes 3, 4, 5
 - d) Sizes 3, 5, 4
 - e) Sizes 4, 5, 6

For questions 11 – 13 choose the maximum cuff inflation volume for the mask size listed.

11. Size 3
 - a) 20 cc
 - b) 30 cc
 - c) 10 cc
 - d) 40 cc
 - e) 50 cc

Scenario 1

You are called to a night club where you find a 20 year-old college student unconscious and unresponsive on a couch. Her friends tell you that they have been drinking Long Island Ice Teas and have been using GHB. They indicate she just “passed out”. They tell you that there was no trauma involved. Upon evaluation, she is unresponsive with a respiratory rate of 4 and a blood pressure of 110 palp. Attempts to ventilate via the BVM produce an oxygen saturation of only 85%.

- Endotracheal intubation attempts are unsuccessful x 2, then proceed with LMA insertion

Scenario 2

You respond to a 25 year-old male who was involved in a motorcycle versus car collision. He was ejected 20 feet and is found unconscious, unresponsive, and apneic. Ventilation attempts via the BVM are ineffective.

- Endotracheal intubation attempt is unsuccessful, proceed with LMA insertion
- NOTE: This is a 2 person technique requiring spinal immobilization

Use as many variants of scenarios as needed that involve adult male and female medical and/or trauma conditions and scenarios involving children in the 30-50 kg group.

Practical Evaluation

15-20 min.

- Utilize the LMA checklist as a practical competency evaluation tool.

Written Evaluation

15-20 min.

- Attached is the 20 question written competency. Also attached is the answer key.
- 85% is required for successful completion

Clinical Rotation :

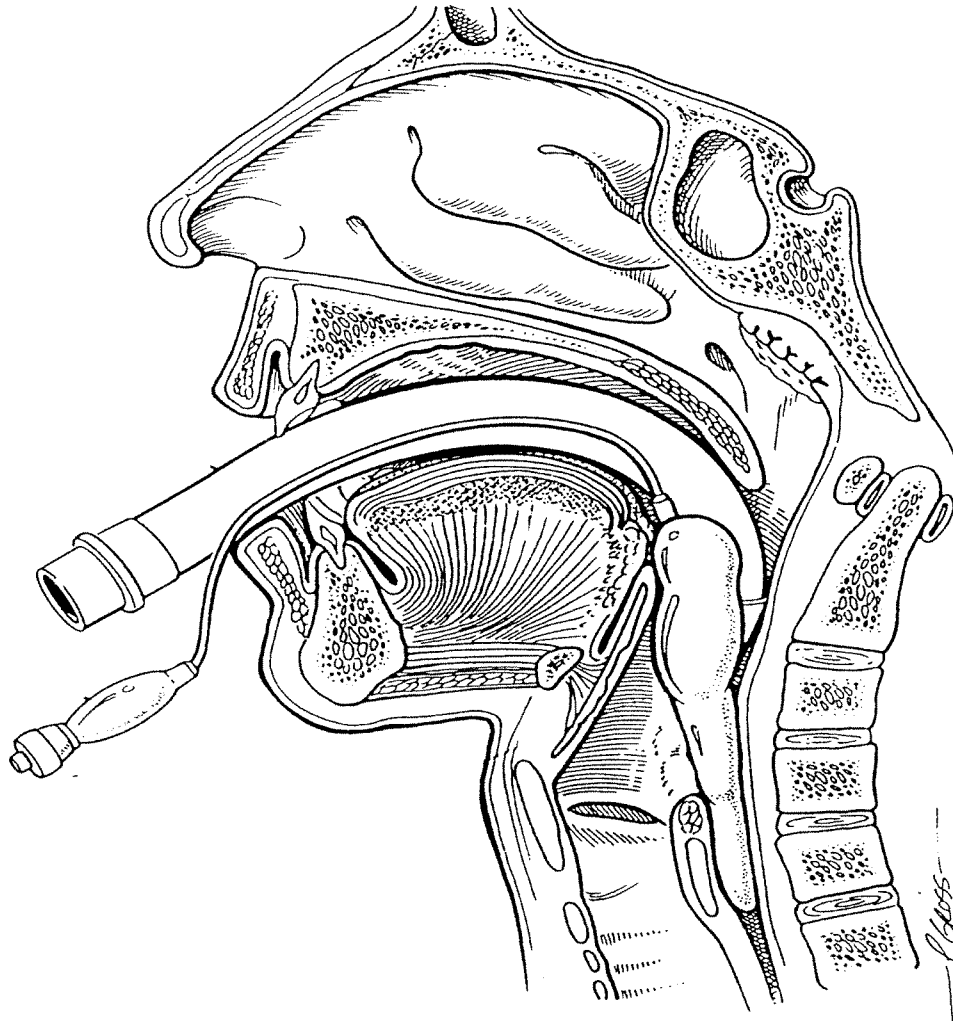
- Lourdes Hospital/Grow Anesthesiology Services
- BVM/Basic Airway Management
- Orotracheal Intubation
- 5 (five) LMA insertions in anesthetized patients

- ◆ Inflate cuff without holding the tube
- ◆ Ensure that the black line running the length of the LMA shaft is in the midline of the upper lip and between the two central incisors
- ◆ Administer gentle positive pressure ventilation
- ◆ Listen for breath sounds bilaterally, look for chest excursion, and check oxygen saturation and end-tidal CO₂
- ◆ Secure in the same fashion as an ET tube
- ◆ Place bite block, gauze or endotracheal tube holder (if available) between teeth to prevent biting tube.
- ◆ Ensure C-spine is still immobilized
- ◆ If repeated attempts are made, oxygenate with 100% O₂ for 2 minutes between attempts if possible

Procedure – Laryngeal Mask Airway Placement

- ◆ Preoxygenate patient with 100% O₂ via bag valve mask if possible X 2 minutes
- ◆ Remove the red tag from the balloon port
- ◆ Check the integrity of the cuff and pilot balloon
- ◆ Tightly deflate the cuff with the syringe
 - The deflated cuff should appear BOAT shaped
- ◆ Lubricate the posterior surface
- ◆ Place patient in neutral sniffing position (if no c-spine/spinal injury suspected)
 - For patients with suspected c-spine injury, perform two person insertion technique
 - One person maintains manual in-line cervical spine stabilization while the other person proceeds with procedure as below:
- ◆ Pull mandible down to open mouth
- ◆ Insert uninflated LMA into oral cavity with cuff facing away from hard palate
- ◆ Guide LMA around curvature of the posterior pharynx into the hypopharynx until resistance is felt. Resistance is due to the tip of the LMA stopping at the upper esophageal sphincter
- ◆ If uninflated LMA insertion is difficult:
 - If the curvature of the posterior/hypopharynx is too acute, perform a jaw thrust, pulling the tongue forward. Alternately, a laryngoscope may be used to lift the jaw/mandible to facilitate insertion.
 - A slight inflation of the cuff to 1/3 – 1/2 of typical inflation volume may also increase ease of insertion
 - Insert LMA with cuff facing hard palate, then rotate 180 degrees into the proper position after the angle around the posterior aspect of the tongue has been cleared.

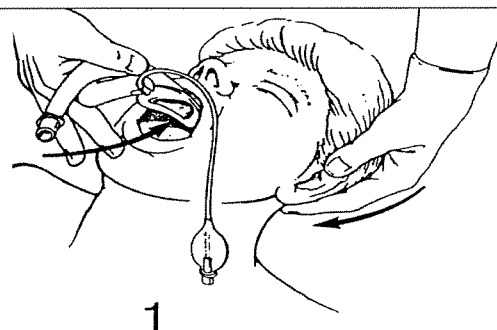
Laryngeal Airway Mask



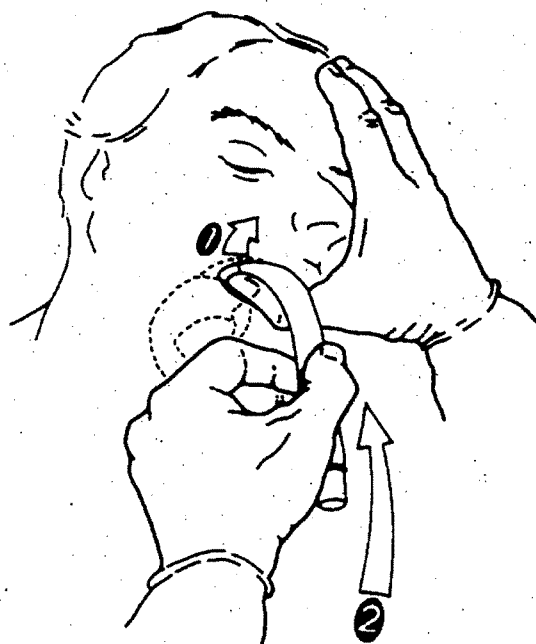
Laryngeal Mask Airway – The correctly placed LMA lies with the tip resting against the upper esophageal sphincter, the sides against the pyriform fossa and the upper border against the tongue. The opening of the distal end of the LMA should be directly over the glottis (the anterior portion under the epiglottis)

Proper placement for an LMA (Emergency Insertion Technique)

1. Place patient in neutral (sniffing position if no cervical spine injury suspected) and pull down on the mandible to open the mouth. Insert the LMA into the oral cavity and hold it against the hard palate. This also may be performed from the foot of the bed.



2. Press the LMA tube firmly against the hard palate by placing a lubricated finger or thumb just inside the mouth under the tube (1). (see figure) Guide the LMA around the curvature of the posterior pharynx and into the hypopharynx until the characteristic resistance is felt as the tip touches the upper esophageal sphincter. (do not place finger into mouth as shown in this figure. Maintaining firm pressure push tube inwards (2) aiming in a cephalad direction so that it slides between the finger and palate until resistance is felt.

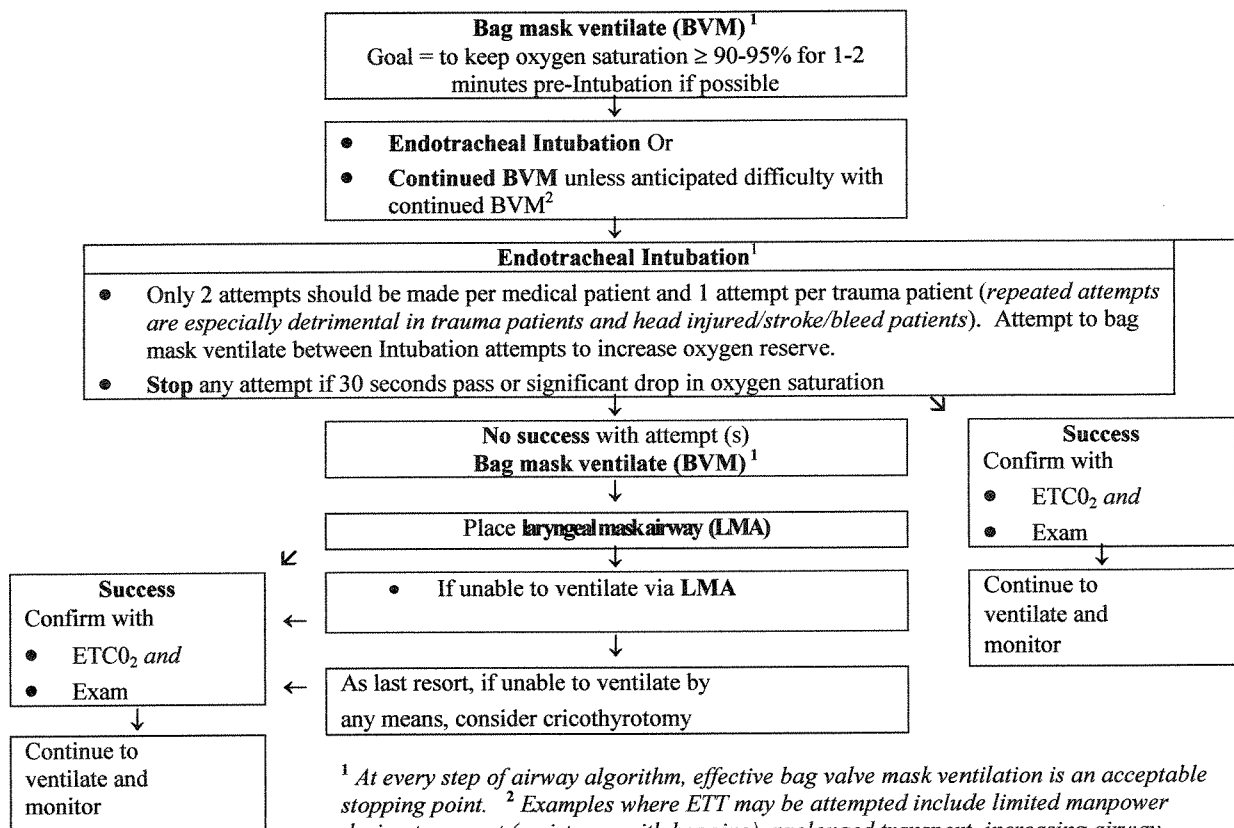


3. Inflate the cuff. This will cause the LMA to advance out of the oropharynx by 1-2 cm. Apply gentle positive pressure ventilation and listen for breath sounds. If successful place bite block.

Airway Management–Adult

Basic and Advanced Life Support

- If suspicion of trauma, maintain C-spine immobilization
- Suction all debris, secretions from airway
- Administer supplemental oxygen (100%), then BVM is indicated
- ◆ Apply cardiac monitor & obtain EKG rhythm strip (simultaneously if assistant available – otherwise perform after airway management)
 - Perform immediate defibrillation as soon as VF is identified
- ◆ Begin continuous oxygen saturation monitoring
- ◆ Follow algorithm below if patient has indication for Intubation
 - Decreased level of consciousness with respiratory failure **OR** poor ventilatory effort (with hypoxia unresponsive to supplemental 100% oxygen) **OR** unable to maintain patent airway



- ◆ Following intubation with ETT, LMA, confirm proper placement:
 - Examine for bowel sounds, breath sounds, and tube condensation.
 - Record and monitor oxygen saturation and monitor continuously.
 - Record end-tidal CO₂ and monitor continuously.

- Patients should not have a step down in the method used to record end-tidal CO₂. For instance, if the patient is initially monitored with a capnographic waveform (e.g. LifePak 12), this should not be switched to colorimetric device for monitoring end-tidal CO₂.
- Record depth of ET tube and secure airway.
 - Utilize rigid cervical collar and long spine board immobilization as tolerated, to secure airway device in place.
 - Record all airway documentation requirements as per Mercy Regional EMS Airway Management Form.

Medical Control _____



Call Medical Control for any additional orders or questions

12. Size 4
a) 20 cc
b) 30 cc
c) 10 cc
d) 40 cc
e) 50 cc
13. Size 5
a) 20 cc
b) 30 cc
c) 10 cc
d) 40 cc
e) 50 cc
14. True/False
The uninflated LMA should be inserted into the oral cavity with the cuff facing away from the hard palate.
a) True
b) False

Questions 15-20 refer to the scenario below:

You respond to a motor vehicle crash and find a 40 year-old male, who was ejected 20 feet, unconscious and unresponsive. He is apneic and his GCS is 3. For items 15-20, choose one of the following choices:

- a) Surgical cricothyrotomy
b) BVM
c) LMA
d) ETT
15. Initial airway maneuver of choice? _____
16. What is the next airway maneuver of choice? (i.e. if the initial airway maneuver of choice is not effective) _____
17. If your options in question 15 and 16 are ineffective and unsuccessful, what is the airway intervention of choice? _____
18. As a last resort, if unable to ventilate by any means, what is the maneuver to consider?

19. The preferred method of airway management would be? _____
20. Which of the above airway interventions is acceptable at every step of the airway algorithm provided ventilation is effective, and oxygen saturation is greater than or equal to 90-95%?

Mercy Regional EMS System
Laryngeal Mask Airway
(LMA)
Answer Key

Prepared December 2002



Answer Key

Laryngeal Mask Airway (LMA)

1. a) A and C
2. b) Apnea
3. a) Attempt ventilations via BVM, attempt endotracheal intubation x 2, attempt LMA insertion, attempt combitube insertion
4. d) One intubation attempt, two person LMA insertion technique
5. d) Sizes 3, 4, and 5
6. a) True
7. b) False
8. c) A #4 size LMA is appropriate for an average size adult female
9. b) Maintain manual control of tube as the cuff is being inflated
10. d) Sizes 3, 5, 4
11. a) 20 cc
12. b) 30 cc
13. d) 40 cc
14. a) True
15. b) BVM
16. d) ETT
17. c) LMA
18. a) surgical cricothyrotomy
19. d) ETT
20. b) BVM

- Airway Management Form will be utilized on all intubations and LMA insertions



In-service Training and Competency Evaluation Program Contents and Outline

Materials:

- LMA Anatomy/Physiology Video
- LMA Insertion Video
- LMA-Unique devices (sizes 3, 4, and 5)
- LMA Insertion PowerPoint Presentation
- Airway manikin (capable of receiving LMA)
- Mercy Regional EMS Airway Management Protocol and Algorithm
- Mercy Regional EMS LMA Emergency Insertion Procedure
- LMA Skills Checklist
- Mercy Regional EMS Airway Management Form
- LMA Competency Evaluation and Answer Key

Program Overview:

- Review of Video Tapes
- Review of PowerPoint Presentation
- Review of Protocol and Airway Algorithm
- Skills Station Case-Based Evaluation
 - Use of checklist
 - Use of Airway Management Form
- Written Competency Evaluation
- Clinical Operating Room Rotation
 - Review BVM /Basic Airway Skills
 - Review Orotracheal Intubation
 - LMA insertions